

Nonlinear Characterization of the Crack Growth Behavior in a Filled Elastomer



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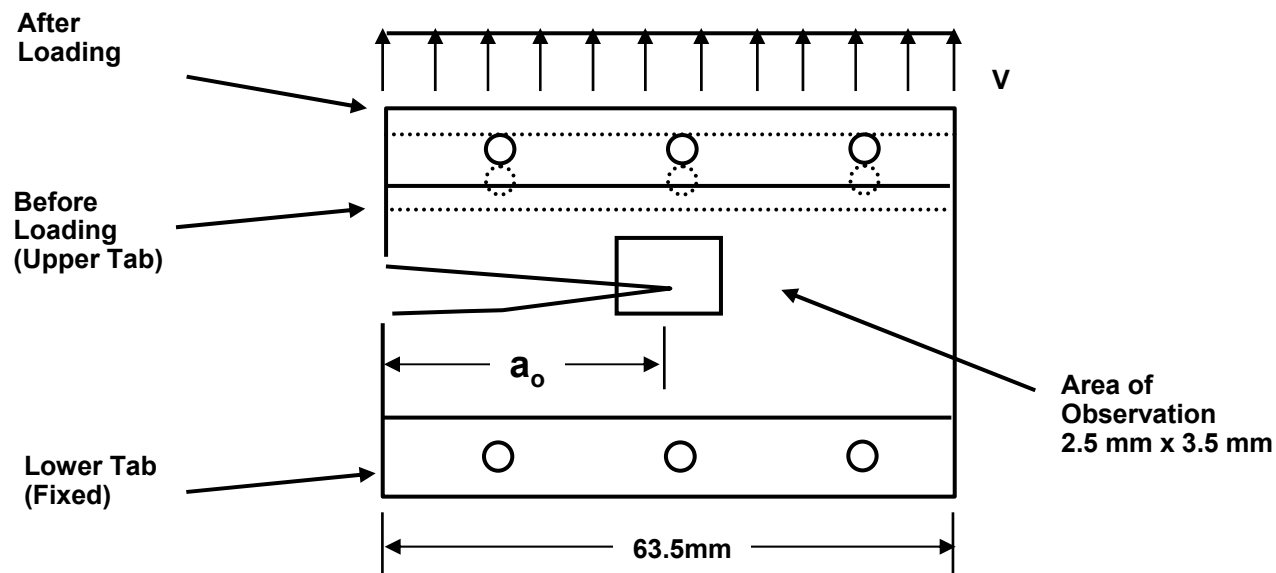
OBJECTIVES



- **Determine J-Integral Using a Hybrid Experimental-Numerical Technique.**
- **Investigate the Effects of Initial Crack Length on the Crack Growth Behavior in the Filled Elastomer.**

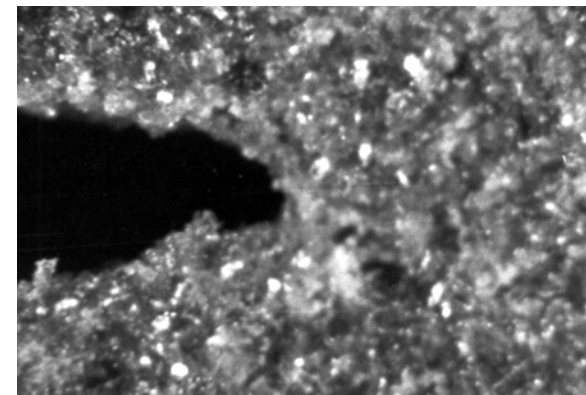
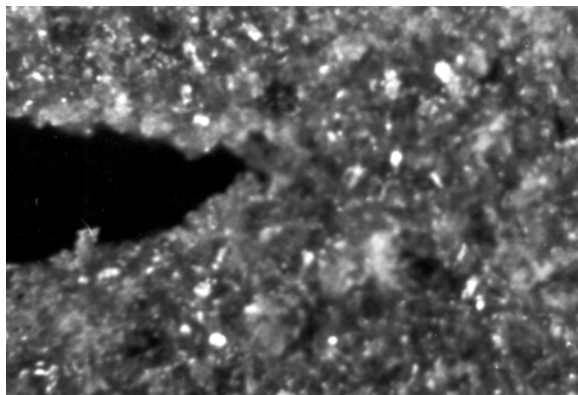
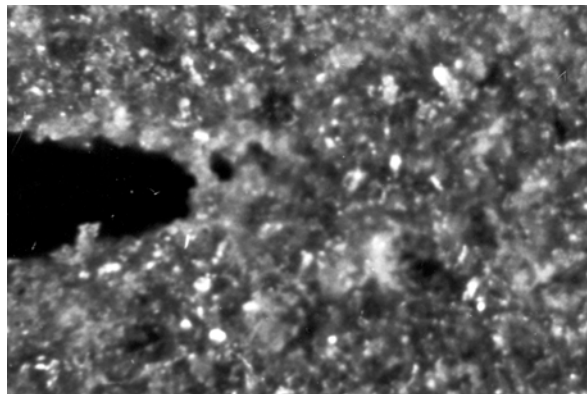


Specimen Geometry



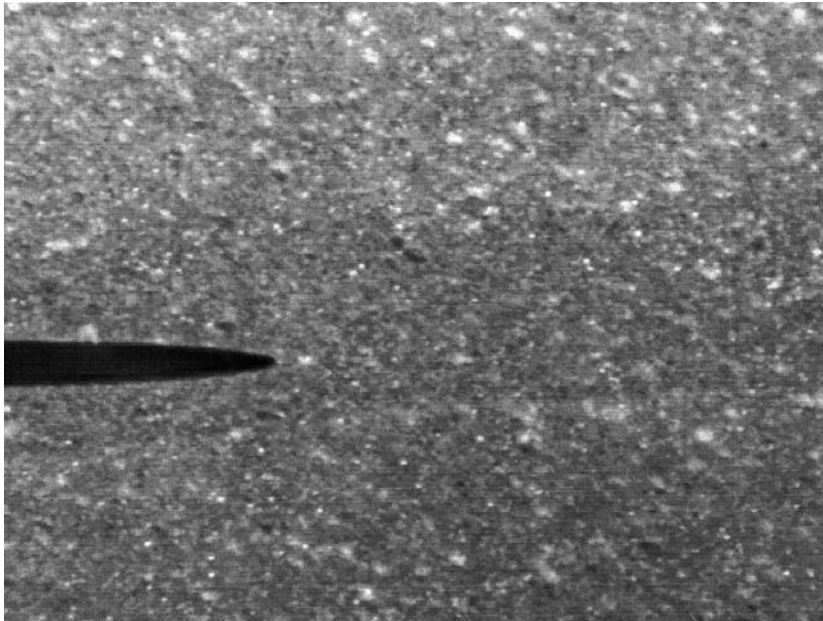


Crack Tip Profiles

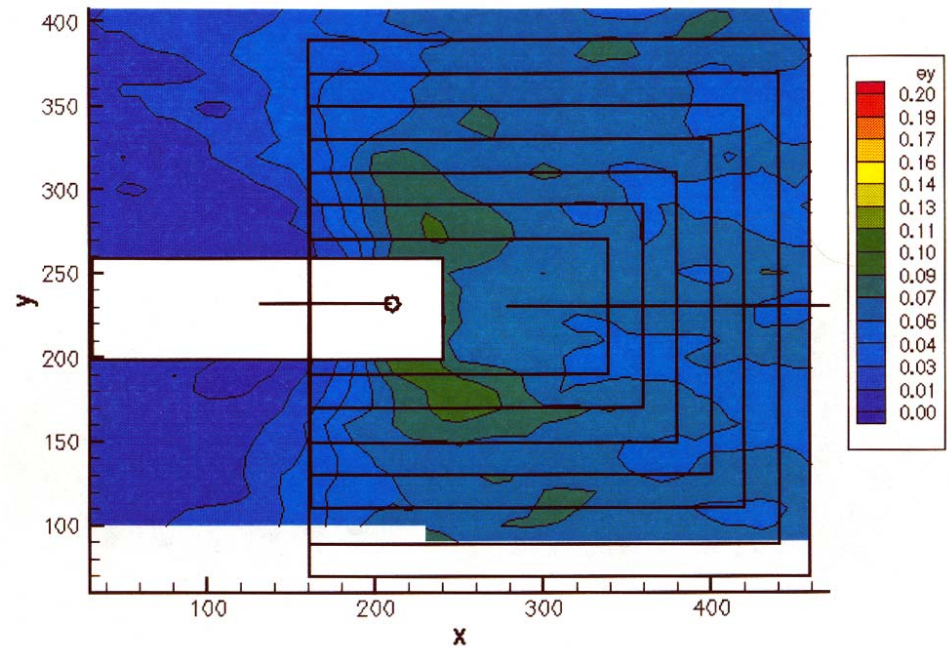




Step 11



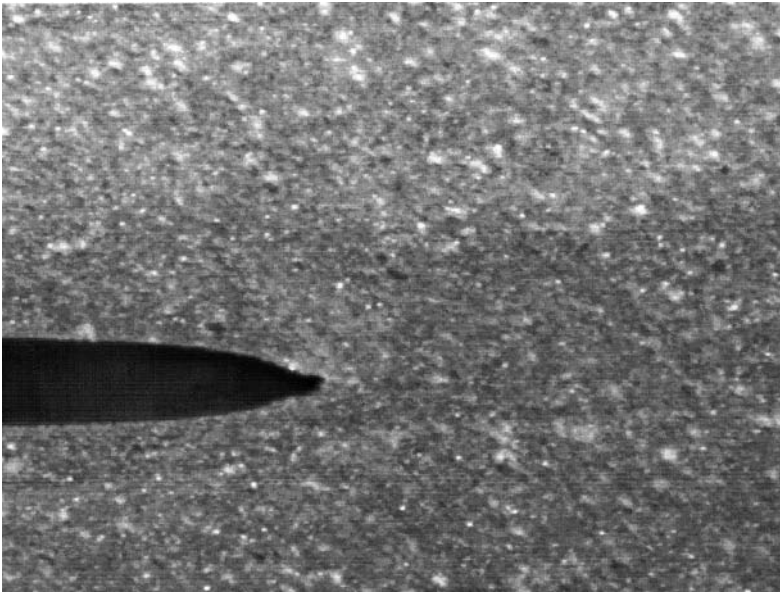
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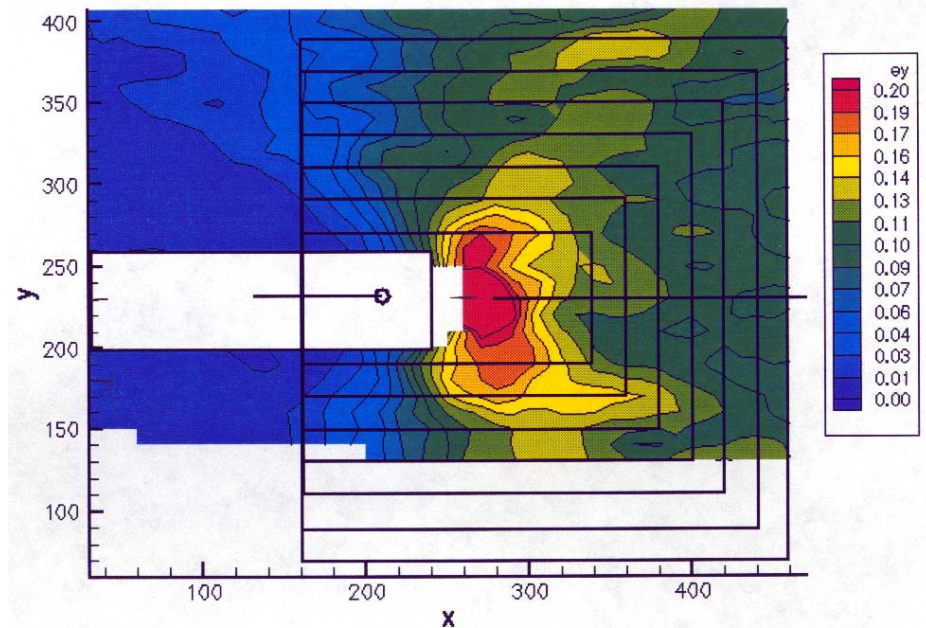
**Strain Distributions and
Integration Paths**



Step 19



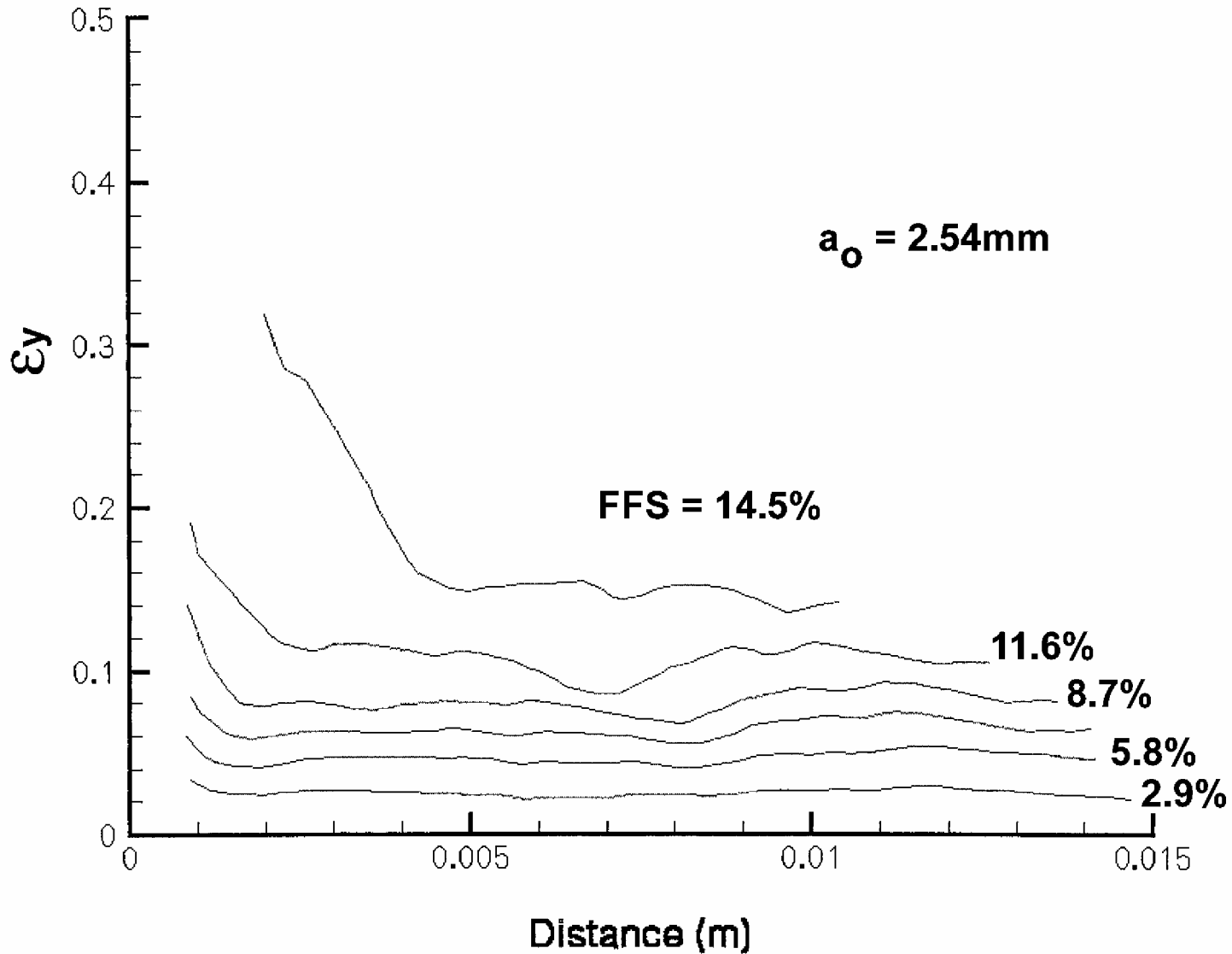
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**Strain Distributions and
Integration Paths**

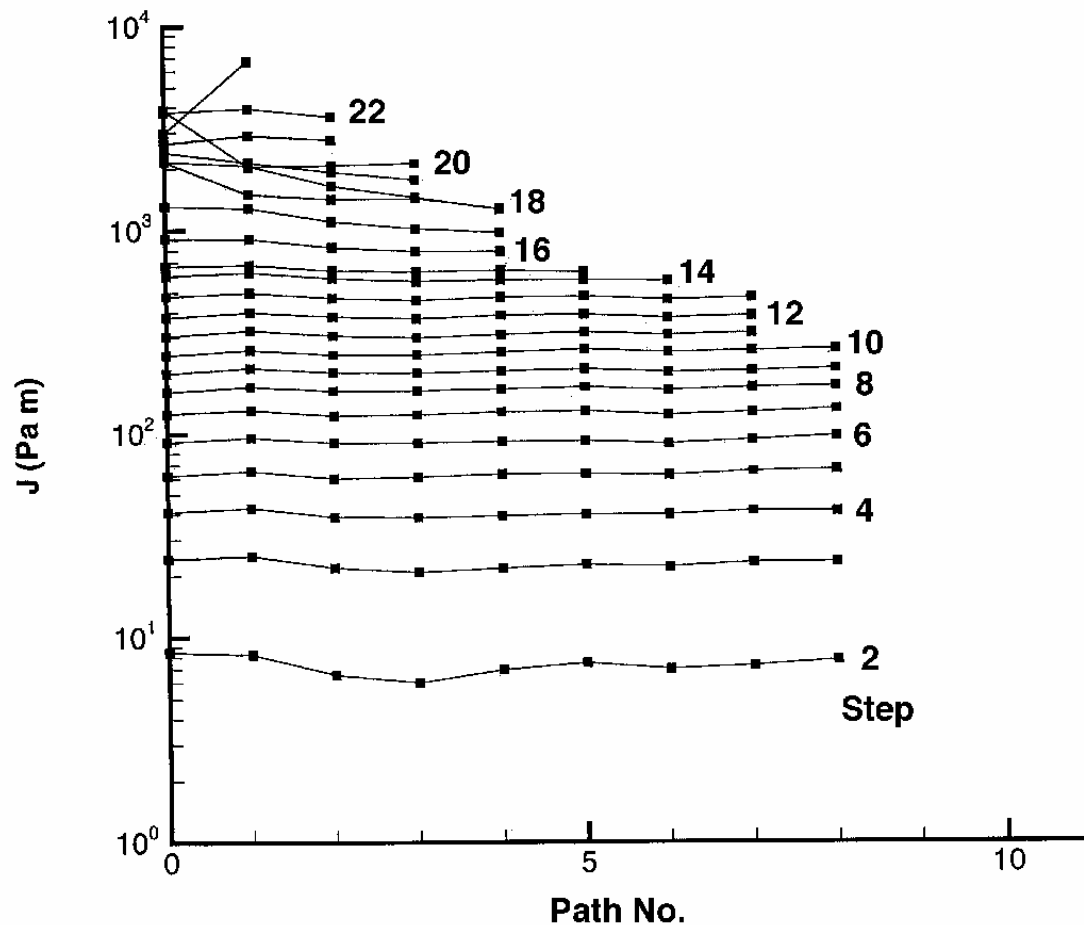


Normal Strain Vs. Distance from Crack Tip



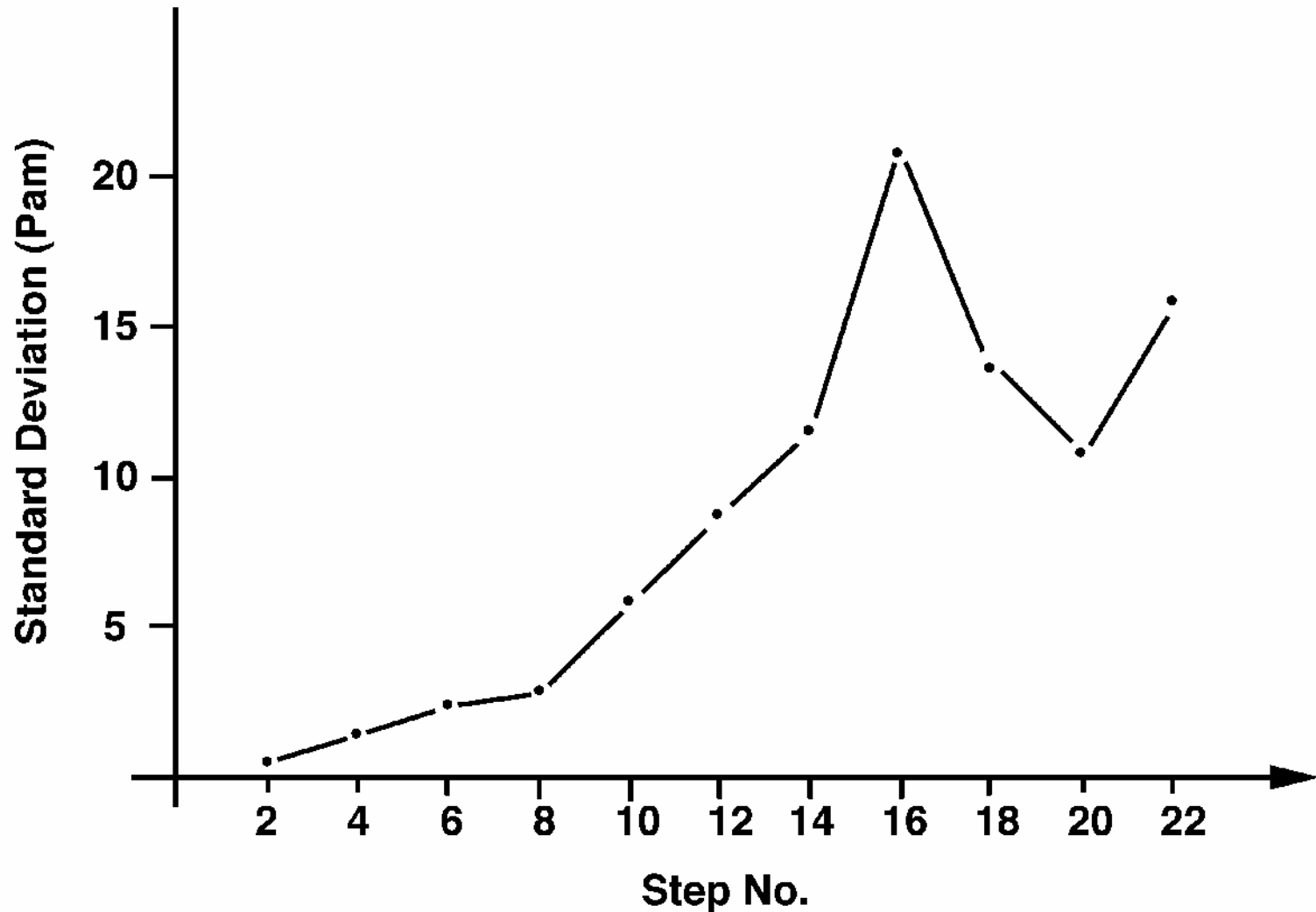


J-Integral Versus Path Number as a Function of Step Number (Applied Strain)



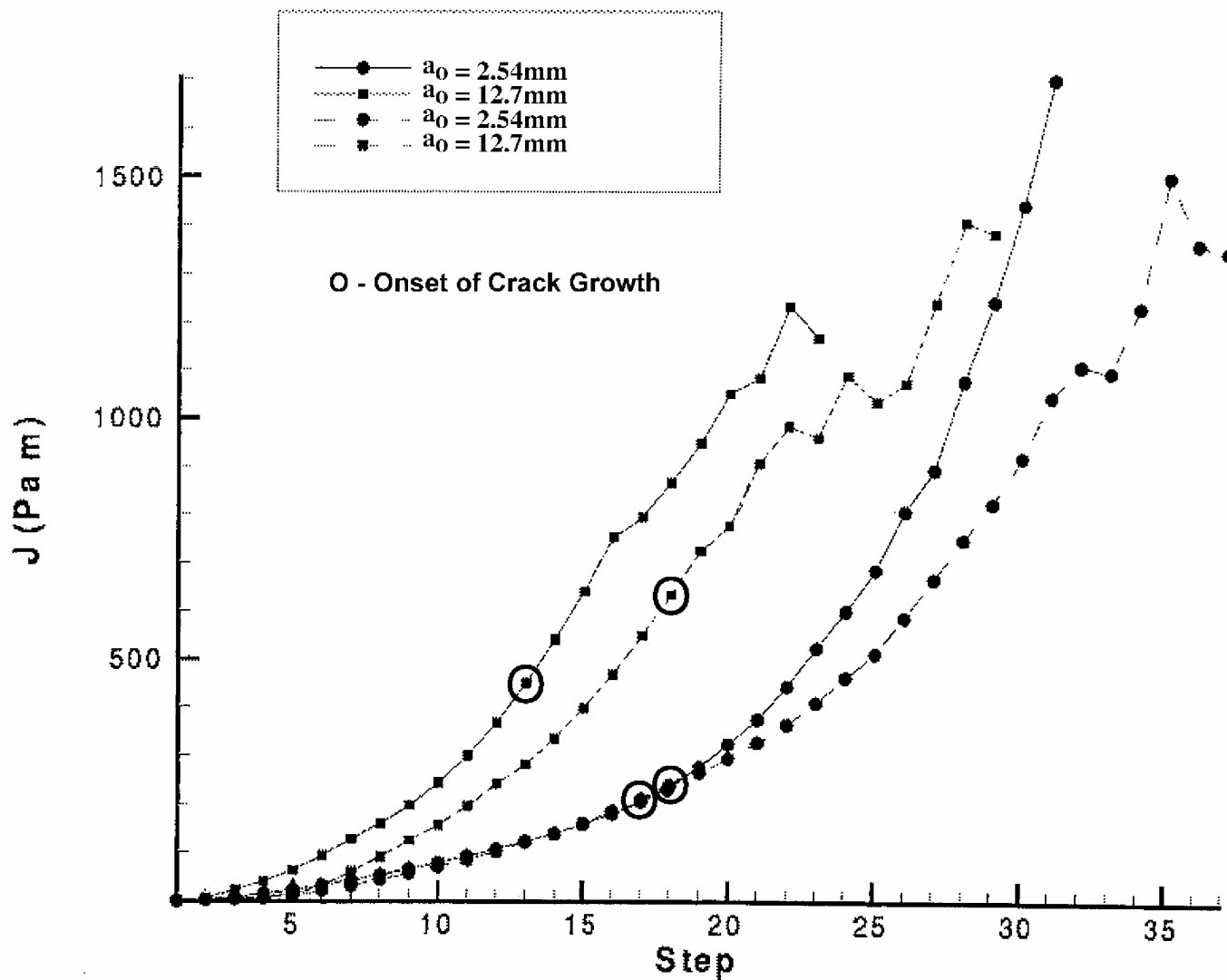


Standard Deviation of J-Integral Versus Step Number (Applied Strain)



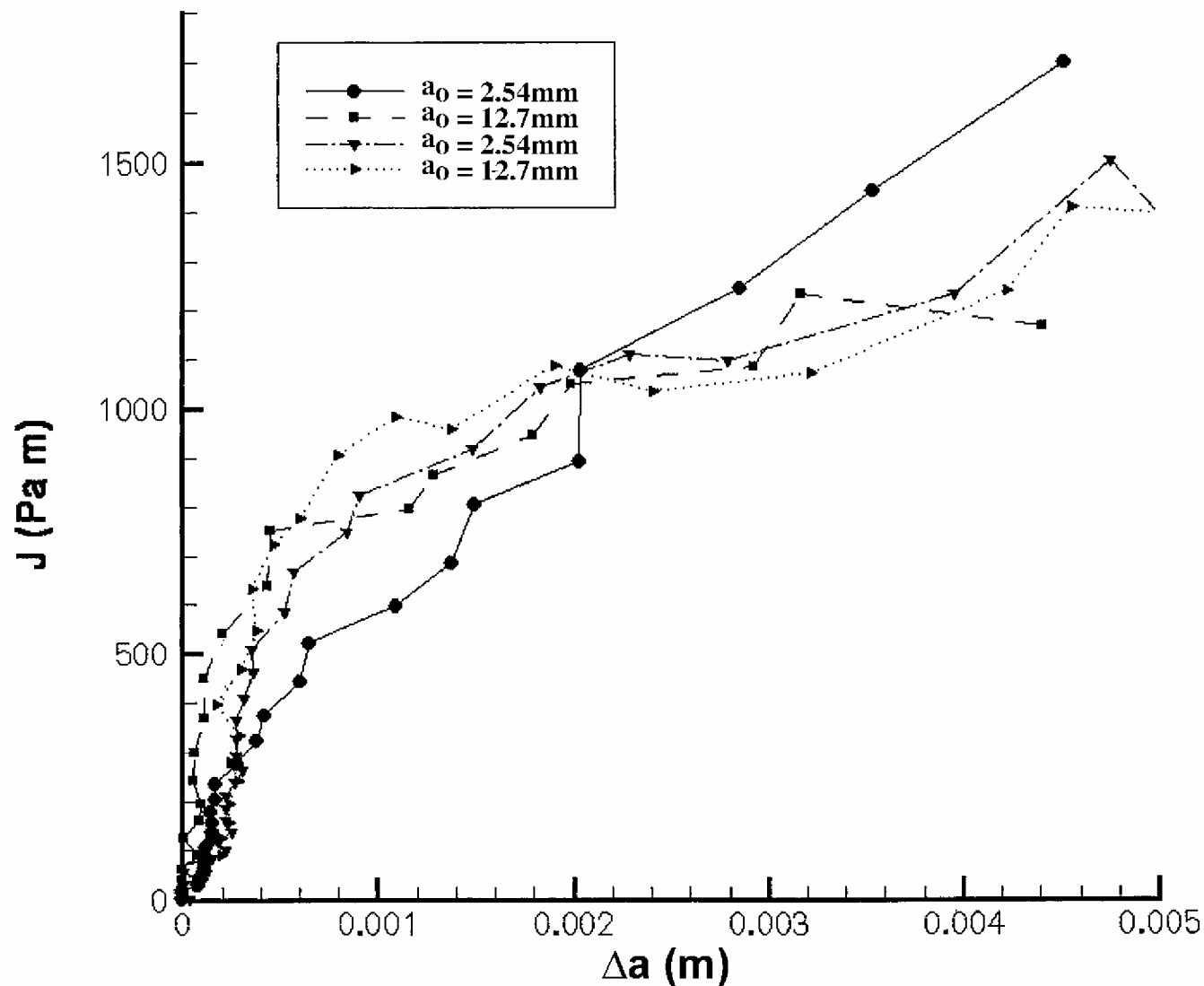


J-Integral Vs. Step Number (Applied Strain)



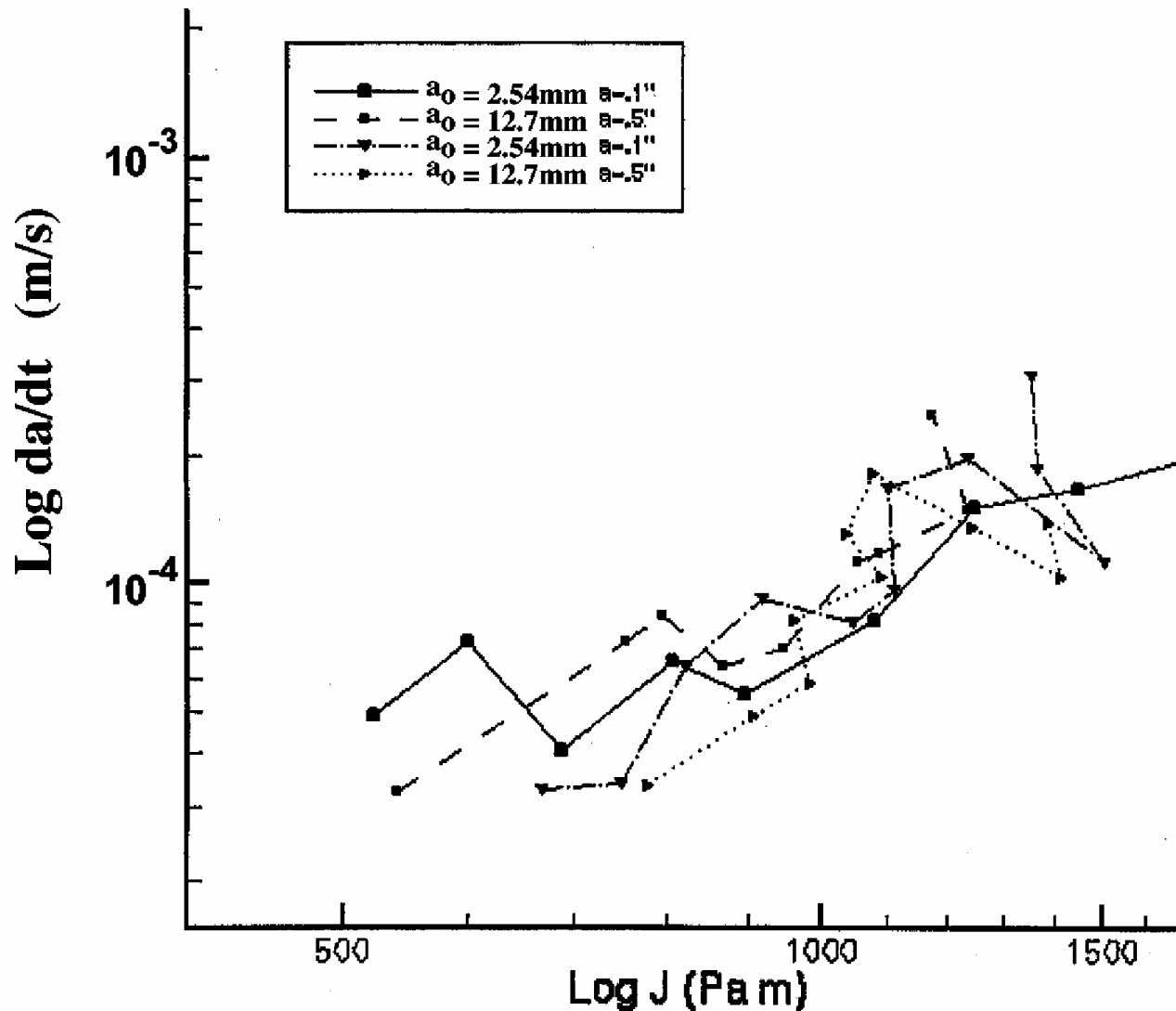


Crack Growth Resistance Curves





Crack Growth Rate Vs. J-Integral

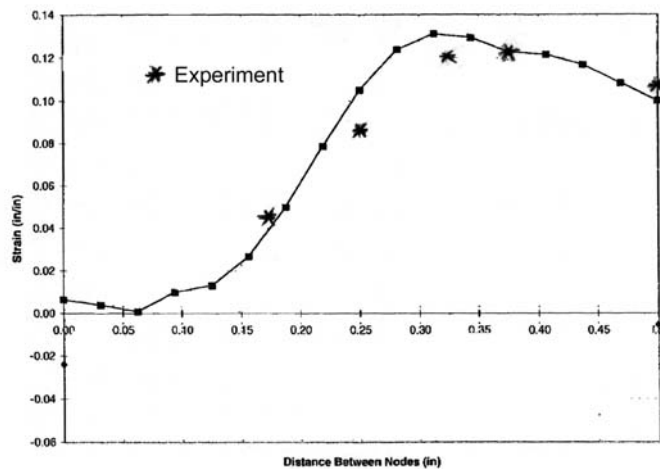




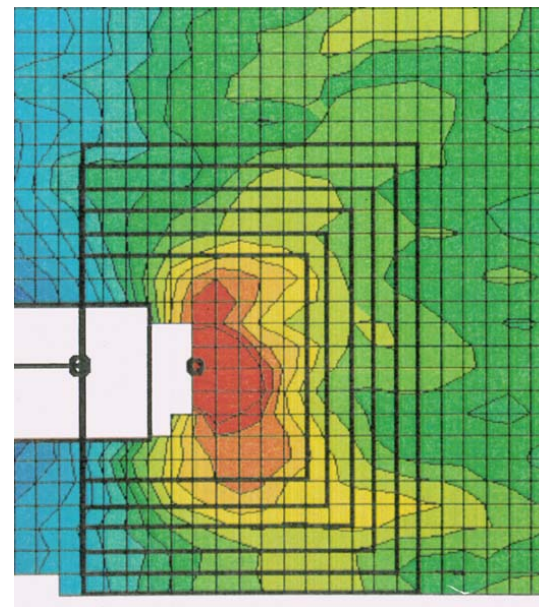
CONCLUSIONS



- On the macroscopic scale, the J-integral is independent of the integration path.
- The initial crack length has no significant effect on the crack growth behavior.
- A considerable amount of stable crack growth takes place before unstable crack growth occurs.
- A power law relationship exists between the crack growth rate and the J-integral



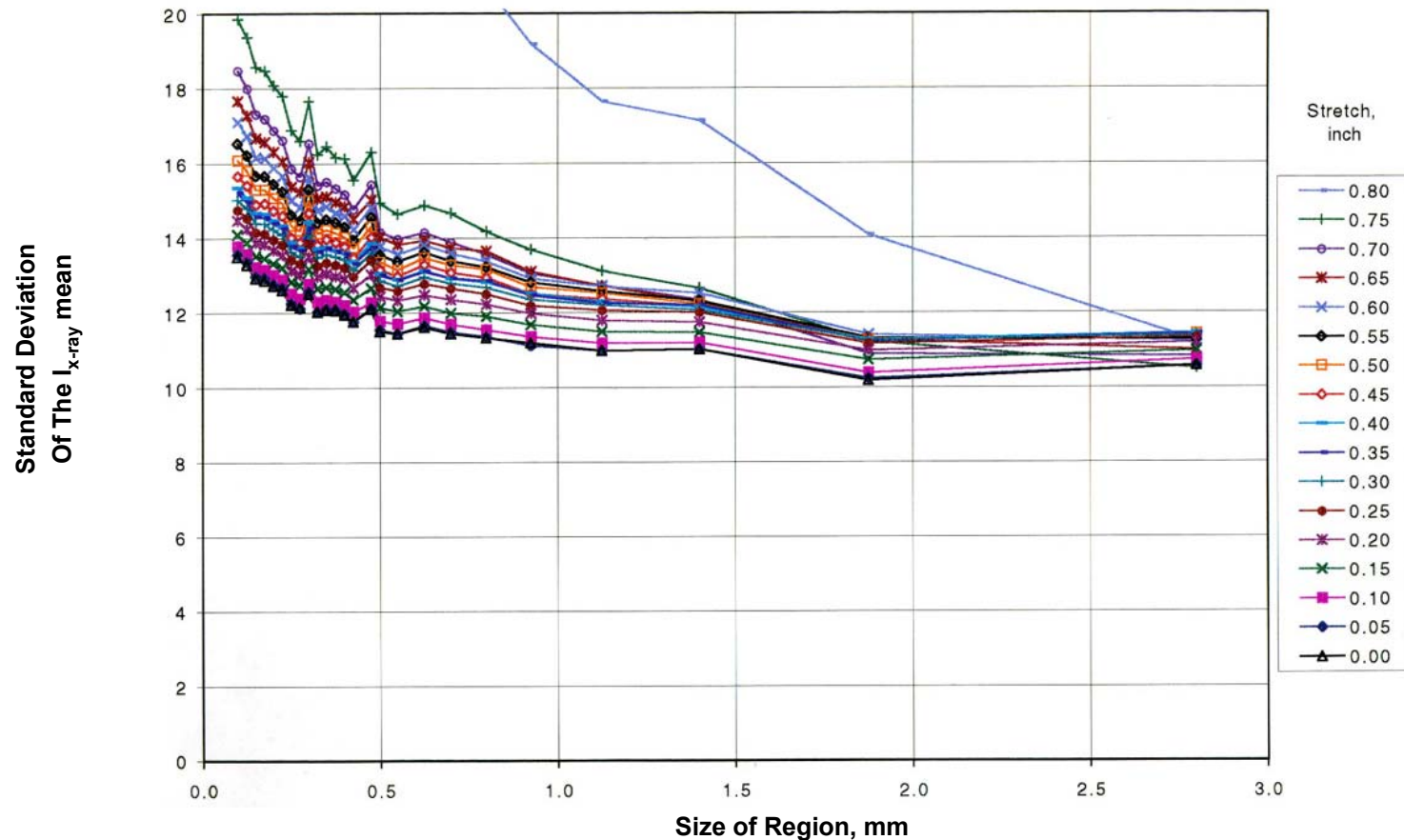
Normal Strain Along an Integration Path



Strain Distributions and Integration Paths

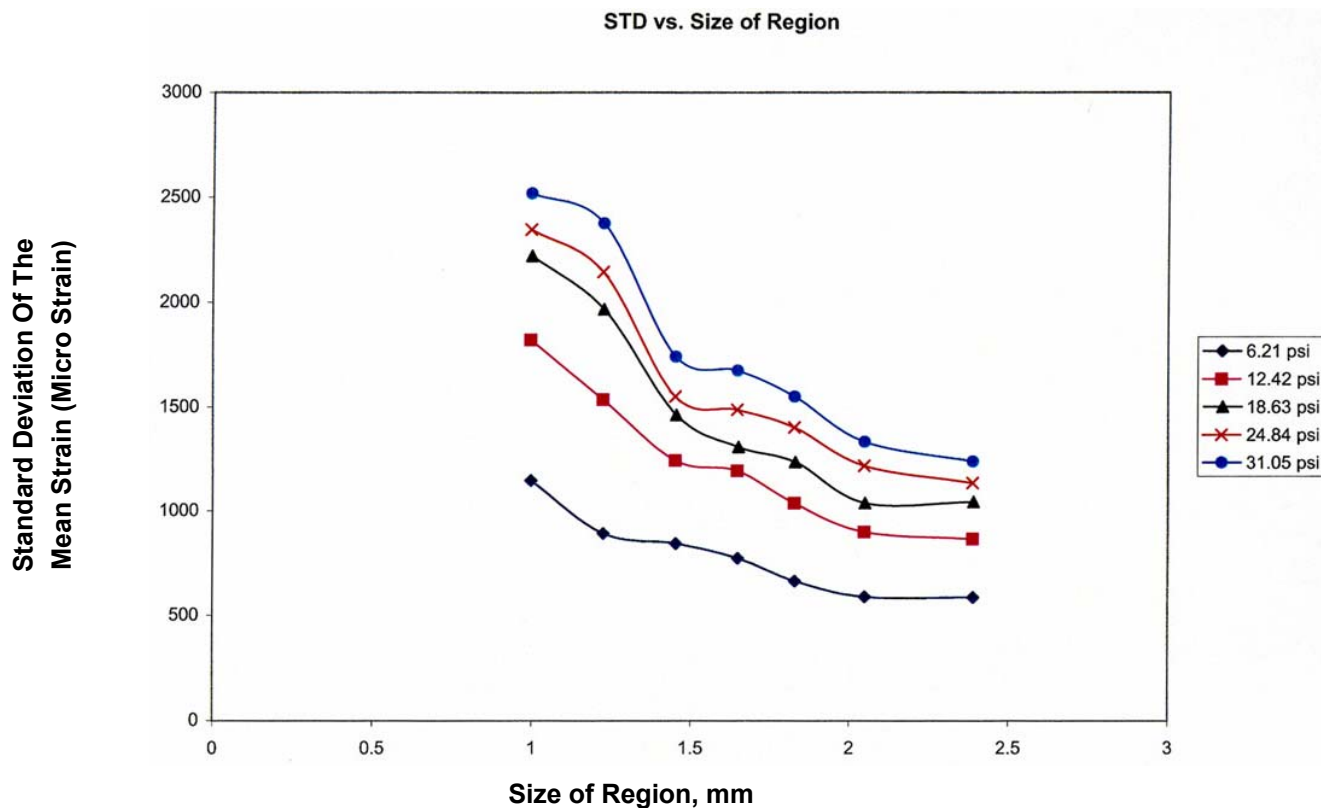


Standard Deviation of X-Ray Intensity Versus Size of Region as a Function of Applied Deformation





Standard Deviation of Strain Versus Size of Region as a Function of Applied Stress





Maximum Principal Distribution at 6% Applied Strain

